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ABSTRACT

This document reports on federal Research and Development (R&D) funding trends for the last 10 years and explains the sources of Federal R&D revisions. The data are obtained from an annual census of approximately 30 federal agencies that report obligation data to the National Science Foundation Survey of Federal Funds for R&D. (YDS)

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CLASSIFICATION REVISIONS REDUCE REPORTED FEDERAL DEVELOPMENT OBLIGATIONS

by John E. Jankowski

The National Institutes of Health (NIH) and the National Aeronautics and Space Administration (NASA) each reported a $2.2 billion decline in fiscal year (FY) 2000 budget obligations for development activities from their FY 1999 levels. These reductions reflect mostly a statistical reclassification of research and development (R&D) and R&D plant funds,[1] rather than a sudden drop in actual funding support. This InfoBrief details the extent of these agencies' revisions and their impact on the relevant Federal aggregate totals.[2]

It is not unusual for respondents to recurring surveys to revise previous data submissions. Indeed, continual review and evaluation for statistical accuracy and construct validity are important steps in reducing measurement error. Respondents' post-submission revisions tend to be relatively small when compared with the aggregate totals. On occasion, however, re-evaluation or re-interpretation of previous data submissions result in more substantive changes that materially affect both cross-sectional and time series analyses. Such was the case with recent survey revisions provided by NIH and NASA to the National Science Foundation's (NSF's) Survey of Federal Funds for Research and Development (Federal Funds for short). Beginning with its FY 2000 data, NIH reconsidered the nature of its R&D and reclassified all of what it previously called "development" activities as "research."[3] Similarly, beginning in FY 2000, NASA reclassified Space Station as a physical asset and Space Station Research as equipment and transferred funding for the program from "R&D" to "R&D plant."[4] As a result, there are major discontinuities in some data series obtained from the survey.

Largely as a result of classification changes, agency-reported inflation-adjusted Federal development obligations plummeted 42 percent between FY 1999 and FY 2000.

[1]R&D and R&D plant include all direct, incidental, or related costs resulting from, or necessary to, performance of R&D and costs of R&D plant. They exclude routine product testing, quality control, mapping and surveys, collection of general purpose statistics, experimental production, and the training of scientific personnel.

[2]The FY 2000 statistics presented in this InfoBrief are revisions to the preliminary data included in the National Science Board's *Science and Engineering Indicators—2002* report (NSB-02-01, Arlington, VA: National Science Foundation). Users are encouraged to utilize these revised data for analyses of FY 2000 Federal R&D patterns.

[3]According to definitions provided to Federal Funds survey respondents, "research is systematic study directed toward fuller scientific knowledge or understanding of the subject studied; it is classified as either basic or applied according to the objectives of the sponsoring agency. In basic research the objective is to gain more complete knowledge or understanding of the fundamental aspects of phenomena and of observable facts, without specific applications toward processes or products in mind. In applied research the objective is to gain knowledge or understanding necessary for determining the means by which a recognized need may be met." "Development is systematic use of the knowledge or understanding gained from research, directed toward the production of useful materials, devices, systems, or methods, including design and development of prototypes and processes."

[4]According to definitions provided to Federal Funds survey respondents, "R&D plant (R&D facilities and fixed equipment, such as reactors, wind tunnels, and particle accelerators) includes acquisition of, construction of, major repairs to, or alterations in structures, works, equipment, facilities, or land for use in R&D activities."

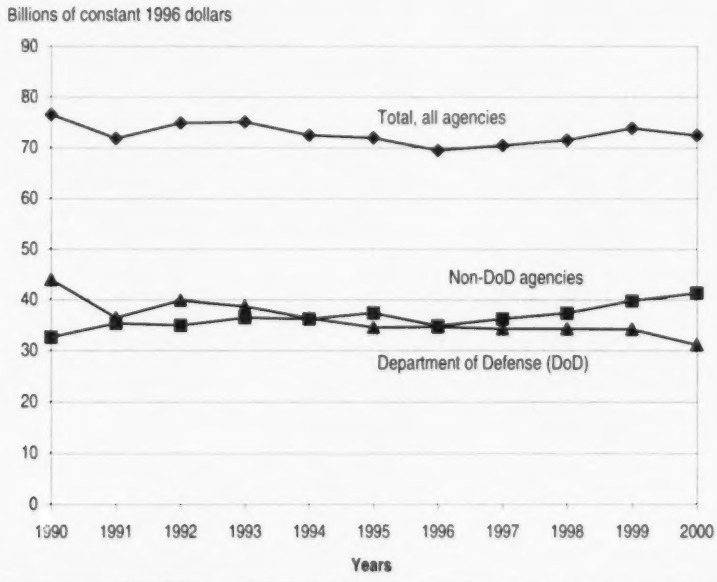
Information and data from SRS—the Division of Science Resources Statistics—are available on the web at: <http://www.nsf.gov/sbe/srs/>. For more information about obtaining reports, contact paperpubs@nsf.gov or call 301-947-2722. For NSF's Telephonic Device for the Deaf, dial 703-292-5090.

Federal R&D Funding Trends

During the past decade, annual Federal funding for R&D plus R&D plant has fluctuated narrowly between $69 billion and $77 billion (in constant 1996 dollars) (figure 1). In FY 1990, the Department of Defense (DoD) obligated 57 percent of this Federal total and non-DoD agencies obligated 43 percent. By FY 2000, there was a mirror reversal of funding shares with DoD obligating 43 percent of the $77 billion R&D and R&D plant total ($72 billion in constant 1996 dollars) and all other agencies obligating 57 percent. Since FY 1996, the combined R&D and R&D plant obligations of non-DoD agencies have increased steadily at a 4.4 percent average annual rate. Of the $44 billion FY 2000 non-DoD total, NIH and NASA account for the largest funding shares—39 percent and 22 percent (or $17 billion and $10 billion), respectively.[5]

Presumably, the reclassification of NIH's and NASA's R&D and R&D plant funding among their component categories would not change the overall level of reported obligations. For example, if $1 billion previously classified and reported as "development" was subsequently reclassified as "research," total "R&D" funding would be unchanged at $1 billion. However, the component funding trends would be changed. The impact of such reclassification changes is graphically displayed in figure 2 with actual reported data. The reported statistics indicate that, between FY 1999 and FY 2000, basic research and applied research increased in real terms by 10 percent and 15 percent, respectively. R&D plant obligations apparently grew by 125 percent, whereas development obligations plummeted by 42 percent. Total funds (not shown separately in the figure) increased by 4 percent, after adjusting for inflation.

Figure 1. **Total Federal R&D trends**

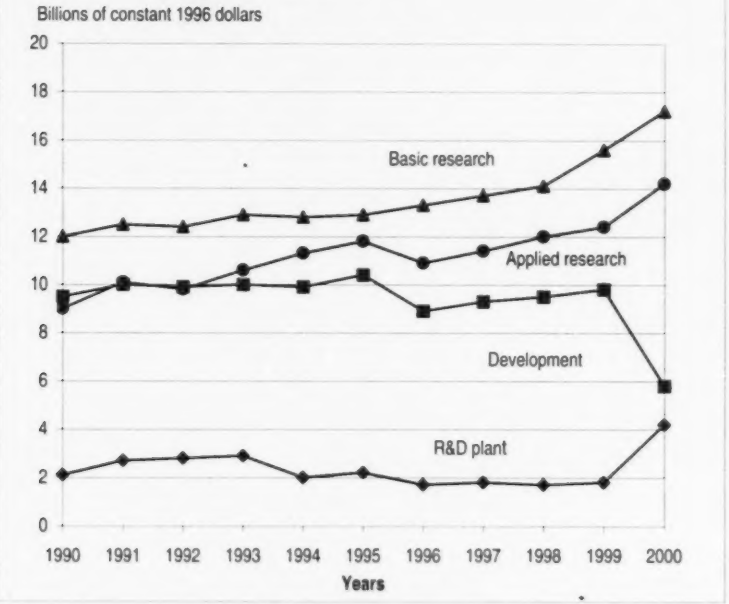


NOTE: Totals are for R&D plus R&D plant.

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Federal Funds for Research and Development

[5]The Department of Energy, at $7 billion, accounts for the next largest funding share and 16 percent of the non-DoD total. All other non-DoD agencies combined account for the remaining $10 billion.

Figure 2. **Non-DoD agencies' R&D trends**



SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Federal Funds for Research and Development

Sources of Federal R&D Revisions

Some portion of these changes undoubtedly reflect actual funding trends (for example, basic and applied research each have been annually increasing since FY 1996). The majority, however, probably result from agencies' revised reporting categorizations. Responses to the Federal Funds questionnaire permit a rough comparison of the impact of data revisions on survey totals. Each year the survey collects information on the previous year's actual obligations and on preliminary estimates of the current year's obligations. Since these data are collected well into the then-current fiscal year (about 6 to 10 months after the start of the fiscal year), the preliminary estimates generally have provided a good indication of the actual levels reported in later surveys.

As indicated by the data in table 1, non-DoD agencies had reported expected FY 2000 obligations for R&D and R&D plant of $44.8 billion. The following year, actual FY 2000 obligations were reported at $44.1 billion, equivalent to an overall 1.5-percent downward revision. But, instead of an approximately $454 million expected increase in development obligations for FY 2000, the revised actual development obligations fell by more than $4 billion. Similarly, non-DoD agencies had reported a combined expected increase in preliminary R&D plant obligations of $297 million. The revised statistics indicate R&D plant funding growth of $2.5 billion.

NIH had preliminarily reported development obligations to remain flat at $2.2 billion in FY 1999 and FY 2000 (table 1). Their revised FY 2000 statistics indicate zero funds for development activities; most (but perhaps not all) of those development funds are now classified as applied research. Previously, NIH's applied research obligations had been expected to decline 4 percent, but the revised data indicate 35 percent growth in such funds. The revised FY 2000 figures for basic research also are slightly higher than the levels NIH had preliminarily reported.

Similarly, NASA had preliminarily reported development obligations to remain flat between FY 1999 and FY 2000, at approximately $5.2 billion (table 1). The revised statistics indicate a $2.3 billion drop in development funds and a comparable $2.5 billion increase in

Table 1. **Federal obligations for research and development (R&D) and R&D plant**

Agency and character of R&D	Billions of dollars			Percent of total		
	FY 1999 actual	FY 2000 preliminary	FY 2000 revised	FY 1999 actual	FY 2000 preliminary	FY 2000 revised
Non-DoD agencies	41.633	44.829	44.141	100.0	100.0	100.0
R&D	39.695	42.594	39.696	95.3	95.0	89.9
Basic research	16.403	17.876	18.340	39.4	39.9	41.5
Applied research	12.982	13.954	15.210	31.2	31.1	34.5
Development	10.310	10.764	6.146	24.8	24.0	13.9
R&D plant	1.938	2.235	4.445	4.7	5.0	10.1
National Institutes of Health	16.168	17.229	17.135	100.0	100.0	100.0
R&D	15.915	16.870	16.918	98.4	97.9	98.7
Basic research	8.636	9.832	10.054	53.4	57.1	58.7
Applied research	5.082	4.856	6.864	31.4	28.2	40.1
Development	2.200	2.181	0.000	13.6	12.7	0.0
R&D plant	0.253	0.359	0.216	1.6	2.1	1.3
National Aeronautics and Space Administration	9.885	9.930	9.755	100.0	100.0	100.0
R&D	9.526	9.568	6.882	96.4	96.4	70.5
Basic research	2.041	1.978	2.305	20.6	19.9	23.6
Applied research	2.317	2.373	1.659	23.4	23.9	17.0
Development	5.168	5.218	2.918	52.3	52.5	29.9
R&D plant	0.360	0.362	2.873	3.6	3.6	29.5

KEY: DoD = Department of Defense

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Federal Funds for Research and Development

obligations for R&D plant. Presumably, most of these revisions reflect the impact of reclassifying Space Station as a physical asset.[6] However, there also were substantial changes in reported obligations for basic research and applied research that probably are unrelated to Space Station reclassifications and these confound analyses of the agency's overall funding trends.

The Federal Funds survey collects information on research funding for 8 major and 32 detailed science and engineering (S&E) fields. In terms of reporting research funding for individual fields, the largest impact of the NIH reclassification of development funds is an apparent increase in Federal (applied) research funding for psychology and the physical sciences, primarily chemistry (table 2). NASA's reclassifications do not significantly affect the S&E research field distributions since most of its changes had an impact on its development and R&D plant totals. The NSF Federal Funds survey does not collect S&E field data for development or R&D plant funds.

[6]The Federal Funds survey does not differentiate between NASA's R&D and R&D plant obligations for the Space Station and for other activities. However, other agency budget sources indicate that total Space Station R&D and R&D plant funding is approximately $2.2 billion. See the NSF/Division of Science Resources Statistics, *Federal R&D Funding by Budget Function: Fiscal Years 2000-2002*, NSF 02-301 (Arlington, VA).

User Notes

The data presented in this InfoBrief are obtained from an annual census of approximately 30 Federal agencies that report obligation data to the NSF Survey of Federal Funds for Research and Development. The complete and latest statistics will be available in the comprehensive Detailed Statistical Tables report, *Federal Funds for Research and Development: Fiscal Years 2000, 2001, and 2002, Volume 50*. Survey variables include R&D totals by agency, by character of work (basic research, applied research, development, and R&D plant), by field of science and engineering, and by performer of R&D. The NIH and NASA reclassifications will affect cross-sectional and trend analyses made on many of these survey variables. Although the classification changes may better reflect the actual nature of these agencies' R&D obligations, users should be cautious in interpreting recent R&D funding trends.

Table 2. **Federal obligations for research, by field of science and engineering**

Field of science and engineering	FY 1999 actual	FY 2000 revised
Total, all agencies		
(Billions of dollars)	33.528	38.471
	Percent of total	
Life sciences	46.0	46.7
Psychology	1.9	4.2
Physical sciences	12.1	12.4
Environmental sciences	9.2	8.7
Mathematics & computer sciences	5.9	5.7
Engineering	18.7	16.5
Social sciences	2.5	2.7
Other sciences, n.e.c.	3.6	3.0
National Institutes of Health		
(Billions of dollars)	12.876	16.918
	Percent of total	
Life sciences	86.8	78.7
Psychology	3.7	8.7
Physical sciences	1.6	3.6
Environmental sciences	0.3	2.1
Mathematics & computer sciences	0.9	0.7
Engineering	1.4	2.3
Social sciences	0.9	1.4
Other sciences, n.e.c.	4.3	2.5

KEY: n.e.c. = not elsewhere classified

SOURCE: National Science Foundation/Division of Science Resources Statistics, Survey of Federal Funds for Research and Development

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